SOME TOPICS IN PORTFOLIO SELECTION

Stat 676a Fall 2002

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Time: Tuesday, Thursday, 2:30-3:45.
Location: 24 Hillhouse

This course is a study in growth rate optimal investment. We explore distributional properties of compounded wealth in repeated gambling and in stock market investment. Wealth concentration properties are explored and the strategies of highest concentrated wealth are derived. Normal theory is developed for log-wealth. Relationships are given to maximum likelihood theory in statistics and to probability concentration properties in physics and information theory. Universal portfolios and their relationship to Bayes methodology is also examined. The ratio of idealized wealth (best with hindsight) to actual wealth is studied both for stochastic stock price sequences and its minimax behavior for arbitrary price sequences. Fast algorithms are developed for computation of universal portfolios.

SOME REFERENCES which you may look up. Some of these may be distributed in class:

BOOK CHAPTERS:

Thomas M Cover and Joy A Thomas (1991), Elements of Information Theory, Wiley. Chapter 6 and Chapter 15.

David Luenberger (1998), Investment Science, Oxford University Press, Chapter 9 and Chapter 15.

Robert C Merton (1990), Continuous-Time Finance, Blackwell Publishers, Chapters 4 and 5.

Jonathan E Ingersoll (1987), Theory of Financial Decision Making, Rowman and Littlefield Publishers, Chapter 11.

JOURNAL ARTICLES:

Paul Algoet and Thomas M Cover (1988), Asymptotic optimality and asymptotic equipartition property of log-optimal investment. Annals of Probability, vol 16, pp 876-898.

Andrew R Barron and Thomas M Cover (1988), A bound on the financial value of information. IEEE Transactions on Information Theory. vol 34, pp 1097-1100.

Robert Bell and Thomas M Cover (1980), Competitive optimality of logarithmic investment. Mathematics of Operations Research, vol 5, pp 161-166.

Robert Bell and Thomas M Cover (1988), Game-theoretic optimal portfolios. Management Science, vol 34, pp 724-733.

Daniel Bernoulli (1954), Exposition of a new theory on the measurement of risk. Econometrica vol 22, pp 23-36 (Translation of D. Bernoulli, 1738, Specimen theoriae novae de mensura sortis, Papers of the Imperial Academy of Science of Saint Peterburg, vol 5, pp 175-192).

Leo Brieman (1960), Investment policies for expanding business optimal in a long-term sense. Naval Research Logistics Quarterly, vol 7, pp 647-651.

Leo Brieman (1961), Optimal gambling systems for favourable games. In the Fourth Berkeley Symposium on Mathematical Statistics and Probability, University of California Press, pp 65-78.

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Jason E Cross and Andrew R Barron (2002). Efficient universal portfolios for past dependent target classes. Preprint.

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Dean P Foster and R V Vohra (1999). Regret in the on-line decision problem. Games and Economic Behavior, vol 29, pp 7-35.

N. Hakansson (1979). A characterization of optimal multiperiod portfolio policies. In Portfolio Theory, 25 Years After: Essays in Honor of Harry Markowitz, editors Elton and Gruber. TIMS Studies in Management Sciences, North-Holland Publishers, vol 11, pp 169-177.

F. Jamshidian (1992). Asymptotically optimal portfolios. Mathematical Finance, vol 2, pp 131-150.

J. L. Kelly (1956), A new interpretation of information rate. Bell System Technical Journal, vol 35, pp 917-926.

H. A. Latane (1959). Criteria for choice among risky ventures. Journal of Political Economy, vol 38, pp 145-155.

H. A. Latane and D. L. Tuttle (1967). Criteria for portfolio building. Journal of Finance, vol 22, pp 359-373.

David C. Larson (1986). Growth optimal trading strategies. Ph.D. Thesis, Stanford University.

J. B. Long (1990) The numeriare portfolio. Journal of Financial Economics, vol 26, pp 29-69.

D. G. Luenberger (1993). A preference foundation for log mean-variance criteria in portfolio choice problems. Journal of Economic Dynamics and Control, vol 17, pp 887-906.

H. Markowitz (1952). Portfolio selection. Journal of Finance, vol 8, pp 77-91.

H. Markowitz (1976) Investment for the long run: New evidence for an old rule. Journal of Finance, vol 31, pp 1273-1286.

Robert C Merton and Paul A Samuelson (1974). Fallacy of the log-normal approximation to optimal portfolio decision-making over many periods. Journal of Financial Economics, vol 1, 67-94.

J. Mossin (1968), Optimal multiperiod portfolio policies. Journal of Business, vol 41, pp 215-229.

Eric Ordentlich and Thomas M Cover (1996). Online portfolio selection. Proceedings of the 9th Annual Conference on Computational Learning Theory.

Paul A Samuelson (1969), Lifetime portfolio selection by dynamic stochastic programming. Review of Economics and Statistics, vol 1, pp 236-239.

Paul A Samuelson (1971), The ``fallacy'' of maximizing the geometric mean in long sequences of investing or gambling, Proceeding of the National Academy of Science USA, vol 68, pp 2493-2496.

Paul A Samuelson (1979), Why we should not make mean of log of wealth big though years to act are long. Journal of Banking and Finance, vol 3, pp 305 -307.

Y. Singer, D. P. Helmbold, R. E. Schapire, and M. K. Warmuth (1998), On-line portfolio selection using multiplicative updates. Mathematical Finance. vol 8, pp 325-347.

Stephen Stearns (2000), Daniel Bernoulli 1738: evolution and economics under risk. J. Biosci. Vol. 25, pp 221-228.

E. Thorp (1963), Portfolio choice and the Kelly criterion, Business and Economic Statistics Section in the Proceedings of the American Association, pp 215-224.

Vladimir Vovk and C.J.H.C. Watkins (1998). Universal portfolio selection. In Proceedings of the 11th Annual Conference on Computational Learning Theory, pp 12-23.

W E Young and R H Trent (1969), Geometric mean approximation of individual security and portfolio performance, Journal of Financial and Quantitative Analysis, vol 4, 179-199.

Qun Xie and Andrew R Barron (2000), Asymptotic minimax regret for data compression, gambling, and prediction. IEEE Transactions on Information Theory, vol 46, 431-445.